90 Drawing the Solar System

When you look into the night sky, most of the objects other than the Moon appear to be about the same size. They also look like they're all about the same distance from Earth. They are neither. Although early astronomers' observations gave people some idea of how big and how far away the planets are, it took the invention of telescopes, satellites, and rockets, to make accurate measurements.

In this activity, you will use a **scale**—a ratio between the actual size of an object and its size in a model—to turn scientific measurements into an accurate model showing the distances of the planets from the Sun.

CHALLENGE

How far away are other planets in the Solar System?

A model, such as this one of a skyscraper, helps people visualize something that is very large or small.

MATERIALS

For each student

- 1 **Student Sheet 90.1, "Talking Drawing 1: The Solar System"**
- 1 **Student Sheet 90.2, "Talking Drawing 2: Scaled Sun-to-Planet Distances"**
- 1 **ruler**

PROCEDURE

Use Student Sheet 90.1, "Talking Drawing 1: The Solar System" to prepare you for the following activity.

Part A: Distances in the Solar System

1. Using the data in Table 1 below and a scale of **1 cm = 200,000,000 km**, calculate the relative distances of the planets from the Sun.

   Hint: To calculate the distance in centimeters (cm), you will need to divide the planet's distance from the Sun in kilometers (km) by the scale.

Table 1: Planets' Distance from the Sun

Planet	Approximate Distance from the Sun (km)
Mercury	58,000,000
Venus	108,000,000
Earth	150,000,000
Mars	227,000,000
Jupiter	778,000,000
Saturn	1,429,000,000
Uranus	2,869,000,000
Neptune	4,505,000,000
Pluto	5,914,000,000

2. Record the results of your calculations in the table on Student Sheet 90.2, "Scaled Sun-to-Planet Distances." Round your answers to the nearest 0.1 centimeter.

3. Using the information you just calculated, make a scaled drawing of the distances on Student Sheet 90.2. Measuring from the center of the Sun, draw an X on the line where each planet is located. Record the name of each planet next to its location on the line.

Part B: Diameters in the Solar System

4. Look at the diameters of the planets shown in Table 2 below.

Table 2: Diameters of the Planets

Planet	Diameter (km)
Mercury	5,000
Venus	12,000
Earth	13,000
Mars	7,000
Jupiter	143,000
Saturn	120,500
Uranus	51,000
Neptune	49,500
Pluto	2,500

5. In your group, discuss the following questions about making a scale model of the planets' diameters.

   - Is the scale used in Part A (1 cm = 200,000,000 km) a useful scale for drawing the diameters of the planets? Explain why or why not.
   - The Sun has a diameter of 1,390,000 km. Is the scale used in Part A (1 cm = 200,000,000 km) a useful scale for drawing the diameter of the Sun? Explain why or why not.
   - Using a piece of regular notebook paper and a pencil, can you draw a picture that uses the same scale to accurately show the diameter of the Sun, the distances from the planets to the Sun, and the diameters of the planets?

6. Carefully examine each of the following models of the Solar System. With your group, discuss what is accurate and what is *not* accurate in each image. Record your ideas in your science notebook.

1

2

3

4

Models of the Solar System

ANALYSIS

1. Astronomers often measure distances in the Solar System using a unit called the **astronomical unit** (AU). One AU is about 150,000,000 km—the distance between Earth and the Sun.

   a. Why do you think the AU is used to measure distance in the Solar System?

   b. Why do you think the AU is not used to measure distances on Earth?

2. What are the main advantage(s) and the main disadvantage(s) of drawing a picture of the Solar System on a piece of regular notebook paper?